



Attorney Docket No. 103152-2

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

APPLICANTS : Minoru Mukaida  
SERIAL NO. : 09/740,345  
FILED : December 18, 2000  
FOR : ENERGY CONSUMPTION EFFICIENCY IMPROVING  
AGENT AND METHOD, AND ARTICLE HAVING  
IMPROVED ENERGY CONSUMPTION EFFICIENCY  
ART UNIT : 1773  
EXAMINER : Uhler, Nikolas J.

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**DECLARATION UNDER RULE 1.132**

I, the undersigned declarant, hereby state as follows:

I am one of the named inventors in the above-referenced application.

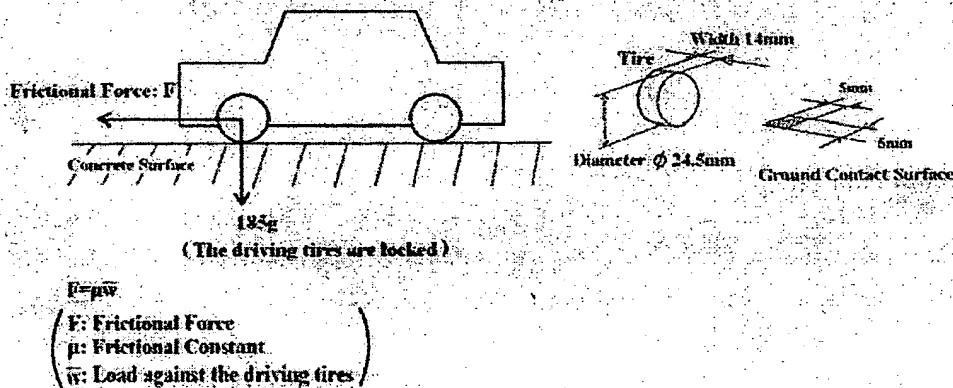
I am a Japanese citizen residing at Shinagawa-ku, Japan.

I conducted the experiments set forth in detail in the following description,  
and I submit this declaration in support of the above-referenced application.

## EXPERIMENTS

The inventor has conducted an experiment, which shows the fact that when a thin film is attached to the ground contact surface of tire, the increase of the ground contact frictional force against a load surface is changed into an energy transmitting force, which improves the energy consumption of vehicles, while the critical point, where the increase of the rolling resistance due to the thickness of the film, which makes the energy consumption worse, exceeds over the rate of the increase of the friction, is  $10 \mu\text{m}$ .

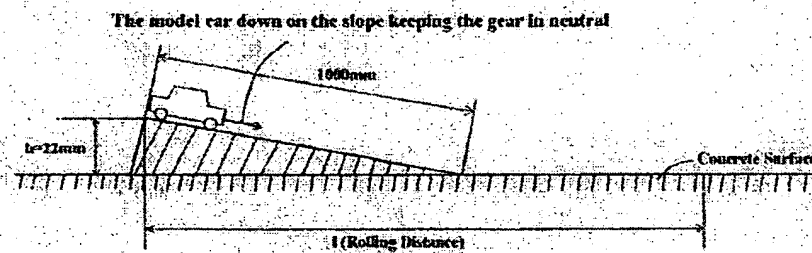
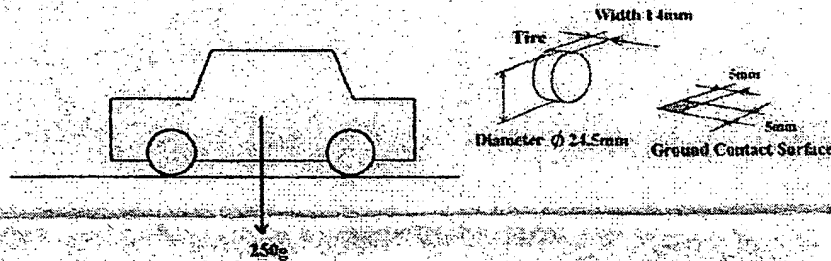
- (1) Difference of the ground contact frictional force due to the thickness of the film attached on the surface of tire (A model vehicle was used for the experiment.)



	Thickness of Film on the Driving Tires			
	$0 \mu\text{m}$ (without film)	$0.01 \mu\text{m}$	$0.5 \mu\text{m}$	$10 \mu\text{m}$
Ground Contact Frictional Force: F	120g	160g	150g	140g
Ground Contact Frictional Constant: $\mu$	0.65	0.85	0.81	0.75
Increasing rate of Frictional Force (Comparison to the tire without film)	—	33.3% increased	25.0% increased	16.7% increased

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- (2) Difference of the rolling resistance due to the thickness of the film attached on the surface of tire (A model vehicle was used for the experiment).



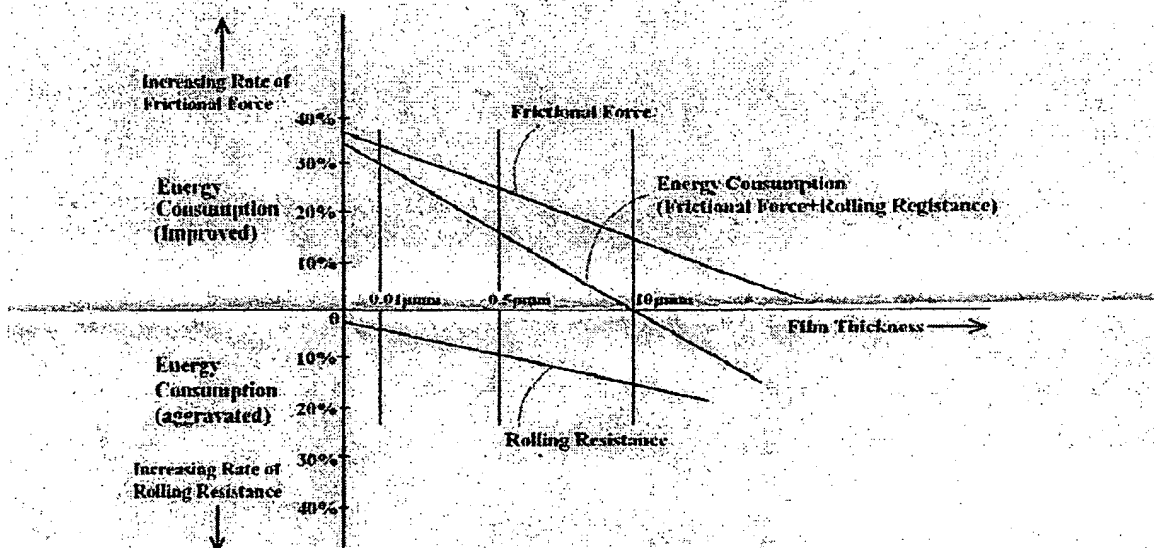
$$v = \sqrt{2gh}, \quad \frac{1}{2} vt = l \quad (v = \text{moving time})$$

$$\text{Rolling resistance } R = m \frac{dv}{dt}, \quad \text{Mean deceleration } b = \frac{dv}{dt}$$

	Thickness of Film on Tires			
	0 $\mu$ m (without film)	0.01 $\mu$ m	0.5 $\mu$ m	10 $\mu$ m
Rolling Distance: l	4280mm	4076mm	3873mm	3669mm
Rolling Resistance: R	0.0126kgf	0.0132kgf	0.0139kgf	0.0147kgf
Mean deceleration: b	50.4mm/s <sup>2</sup>	52.9 mm/s <sup>2</sup>	55.7 mm/s <sup>2</sup>	58.8 mm/s <sup>2</sup>
Increasing rate of Rolling Resistance (Comparison to the tire without film)	—	5.0% increased	10.5% increased	16.7% increased

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(3) Experimental result: (1) + (2)



The thin film used in the experiment was prepared and applied to the tire surface in accordance with presently amended claim 1, as follows:

The film had a viscosity of 100,000 cp or less, and contained antislipping agents, the antislipping agents consisting of fine particles of an average particle diameter of 10  $\mu\text{m}$  or less. The film comprised a polymer binder selected from the group consisting of polyethylene; a methyl, phenyl, chloro, hydroxy, acetoxyl, or cyano derivative of polyethylene; polybutadiene; a methyl or chloro derivative of polybutadiene; a copolymer of said polyethylene derivative and said butadiene derivative; silicone; polysulfide; polyurethane; modified silicone; modified epoxy resin; and modified acrylic resin.

All statements made herein on knowledge are true, and all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statement and the

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like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date:

December 25, 2004

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